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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/682,411	08/30/2001	Zheng Tang	45283.4	7773

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EXAMINER

CREPEAU, JONATHAN

ART UNIT	PAPER NUMBER
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1745

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/20/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

09/682,411

Applicant(s)

TANG ET AL.

Examiner

Jonathan S. Crepeau

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11-20,22 and 23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11 is/are allowed.
- 6) ☒ Claim(s) 12,13,15,18-20,22 and 23 is/are rejected.
- 7) ☒ Claim(s) 14,16 and 17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. This Office action addresses claims 11-20, 22, and 23. Claims 12, 13, 15, 18-20, 22, and 23 remain rejected under 35 USC §103 herein. Claim 11 is allowed and claims 14, 16, and 17 are objected to as containing allowable subject matter.

As stated in the previous Office action, regarding the previous amendment to claim 22, this amendment is not in the proper format. Double brackets or strikethrough, rather than single brackets, must be used to indicate deletions. If another copy of the claims is submitted, however, a clean copy of claim 22 with the status identifier “previously presented” would be acceptable.

Claim Rejections - 35 USC § 103

2. Claims 15, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-87472.

Regarding claim 15, the reference is directed to a solid oxide fuel cell comprising an electrode layer (2, 3) applied to an electrolyte layer (1). The electrode layer comprises discrete elements separated by substantially uniform gaps (see abstract; Fig. 5). As shown in Figure 6C, the discrete elements appear to have a generally circular shape and are evenly and uniformly spaced.

JP ‘472 does not expressly teach that the discrete elements are polygonal in shape, as recited in claim 15, or that such polygons have parallel edges.

However, the claimed polygonal shape of the discrete elements is a matter of choice which a person of ordinary skill in the art would have found obvious, absent sufficient evidence to the contrary (MPEP §2144.04 (IV)). As such, the claimed shapes of the discrete elements are considered to be obvious to a person of ordinary skill in the art.

The reference also does not expressly teach that the gaps between elements take up less than about 5%, 2%, or 1% of the surface area of the electrode, as recited in claims 15, 22, and 23.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be sufficiently motivated to make the gaps as thin as possible in the interest of increasing contact area and decreasing electrical resistance. Accordingly, Applicants' claimed ranges are also not considered to distinguish over the reference. Furthermore, the recitations of linear gaps, uniform gaps, and parallel edges would also be rendered obvious due to the close packing of square electrode elements on the electrolyte sheet.

3. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-87472 as applied to claims 15, 22, and 23 above, and further in view of Carolan et al (U.S. Patent 5,750,279).

JP '472 does not expressly teach that a contact paste is coated on the electrode, as recited in claim 18.

Carolan et al. is directed to a solid oxide fuel cell. In column 6, lines 23-28, the reference teaches a conductive paste located between the electrode and interconnector.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the conductive paste of Carolan et al. between the electrode of JP '472 and an interconnector. In column 13, line 41, Carolan teaches that "[t]he conductive material 340, 342 serves to direct electrons from the anode layer 326 to the interconnect layer 316, and from the interconnect layer 316 to the cathode layer 332." Thus, the artisan would be motivated to use the conductive paste of Carolan et al. between the electrode of JP '472 and an interconnector in hopes of improving electrical conductivity (i.e., decreasing electrical resistance) between the two.

4. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-87472 as applied to claims 15, 22, and 23 above, and further in view of Ruhl et al (U.S. Patent 6,361,892).

JP '472 further teaches that the electrode layer is made by photo-etching in the abstract. However, the reference does not expressly teach that the electrode is made by screen-printing followed by sintering, as recited in claim 12.

Ruhl et al. is directed to a solid oxide fuel cell comprising an electrode layer applied to an electrolyte layer, which electrode layer comprises discrete elements (see col. 8, lines 39-42; Figs. 2 and 3). The electrode layer may be made by screen printing, etching, or photolithography,

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among other methods, which can be followed by sintering (see col. 6, line 29; col. 8, line 22 et seq).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the disclosure of Ruhl et al. indicates that screen printing and photolithography (photo-etching) are equivalent methods for fabricating discrete SOFC electrode elements. As such, it would have been obvious to substitute the screen printing process of Ruhl et al. for the photolithographic process of JP '472. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982); MPEP §2144.06. Further, the sintering step disclosed by Ruhl would also be an obvious modification of the process of JP '472 because the solid oxide fuel cell of JP '472 would be operated at a high temperature that would require sintering of the components.

5. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-87472 in view of Ruhl et al. as applied to claim 12 above, and further in view of Carolan et al (U.S. Patent 5,750,279).

JP '472 does not expressly teach that a contact paste is coated on the electrode, as recited in claim 13.

Carolan et al. is directed to a solid oxide fuel cell. In column 6, lines 23-28, the reference teaches a conductive paste located between the electrode and interconnector.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to use the conductive paste of Carolan et al. between the electrode of JP '472 and an interconnector (separator). In column 13, line 41, Carolan teaches that "[t]he conductive material 340, 342 serves to direct electrons from the anode layer 326 to the interconnect layer 316, and from the interconnect layer 316 to the cathode layer 332." Thus, the artisan would be motivated to use the conductive paste of Carolan et al. between the electrode of JP '472 and an interconnector in hopes of improving electrical conductivity (i.e., decreasing electrical resistance) between the two.

6. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2-87472 in view of Carolan et al. as applied to claim 18 above, and further in view of Singh et al (U.S. Patent 5,516,597).

Carolan et al. further teach that the conductive material may be formed from an electrode material (see col. 6, line 26). However, Carolan et al. do not expressly teach that the conductive material is lanthanum cobaltate, as recited in claim 19.

Singh et al. is directed to a solid oxide fuel cell. In column 6, line 52, Singh et al. teach the following:

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niques. The air electrode is typically comprised of doped and undoped mixtures of metal oxides such as LaMnO_3 , CaMnO_3 , LaNiO_3 , LaCoO_3 , LaCrO_3 and other electrically conducting metal oxides. The dopants are typically Sr, Ca, Co, Ni, Fe, Sn, Ba, Ce or the like. The preferred air electrode

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by Singh et al. to use lanthanum cobaltate as the conductive material of Carolan et al. Carolan et al. disclose that a suitable material is electrically conductive or an electrode material. In the passage above, Singh et al. identify LaCoO_3 as being electrically conducting and an electrode material. The selection of a known material based on its suitability for its intended use has been held to be *prima facie* obvious (MPEP §2144.07). Thus, the artisan would have been sufficiently skilled to use LaCoO_3 as the conductive material of Carolan et al.

Response to Arguments

7. Applicant's arguments filed April 24, 2006 have been fully considered but they are not persuasive. As noted below, Applicant's arguments with respect to the hexagonal shape are persuasive and the claims reciting this feature are now considered to contain allowable subject matter. However, the arguments with regard to the polygonal shape in general are not persuasive. As stated in the remarks and in the instant specification, the hexagonal shape provides significant advantages such as reducing stress concentrations at the corners of the elements. In [0015], the instant specification states that "not all shapes may have the same advantages of hexagons as described herein." Thus, while the recitation of "hexagons" is

considered to patentably distinguish over the prior art, the recitation of “polygons” in general is still not considered to be patentably distinguishable.

Applicants further assert that gaps minimized to 5% of the surface area of the reference electrode would result in an impractically compromised electrode. Applicant’s argument is well-taken; however, it remains the Examiner’s position that the artisan would be sufficiently motivated to make this modification, and have a reasonable expectation of success in doing so. It is acknowledged that some optimization would be involved among the factors that Applicant discusses. However, it is still believed that the artisan would be motivated to cover as much of the electrolyte as possible with the electrode material in the interest of increasing current density and decreasing contact resistance. As such, the position is maintained that the artisan would be sufficiently motivated to make this modification, and have a reasonable expectation of success in doing so.

Allowable Subject Matter

8. Claim 11 is allowed.
9. Claims 14, 16, and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
10. The following is a statement of reasons for the indication of allowable subject matter:

Claims 11, 14, and 16 each recite that the electrode is formed of a plurality of hexagonal elements. For the reasons stated in Applicant's remarks of 1/29/07, this subject matter is considered to patentably distinguish over the JP '472 reference.

Conclusion

11. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan, can be reached at (571) 272-1292. The phone number for the

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organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Jonathan Crepeau
Primary Examiner
Art Unit 1745
February 14, 2007